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Effect of Red Squirrels on Crown Form of Black Spruce in Alaska

Black spruce, Picea mariana (Mill.) B.S.P., in Alaska commonly presents a crown form (fig. 1) that seems to be unique among conifers. Mature trees often have a tufted or tasseled appearance that is sufficiently characteristic to permit their certain identification as black spruce, even at a distance. The peculiar crown form results from stem segments near the top of the tree that are bare of branches. There may be one or more branchless sections, each one to two feet in length, below the terminal tuft of branches. When two or more bare sections occur, the top has a storied aspect.

Figure 1.--Black spruce with tufted crowns resulting from pruning by red squirrels. On a flat adjacent to the Tanana River.

The writer first observed the tufted tops of black spruce in Alaska in 1925 but it was not until 1949 that he examined them closely and learned the cause. Meanwhile, and unknown to the writer, two other foresters had observed the phenomenon in different regions and had arrived at the explanation. In 1936, in a thesis for the degree of Master of the Science of Forestry at the University of Toronto, Millar (1) reported on the silvicultural characteristics of black spruce in the clay belt of northern Ontario. His observations are worth quoting directly:

> Squirrels, gathering cones, nip off quite a few twigs. They confine themselves to the old trees and indirectly benefit the trees. Often due to the squirrels a narrow band is cleared three or four feet from the tip. This isolates the cones in a clump at the top of the tree and saves them to a certain extent during fires. It seems extremely probable that the new crop, following a fire, comes mainly from seed present on the tree during the fire (1, p. 30).
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> It has been observed that a fire in a black spruce stand does not consume the extreme tip of the tree and the cones. Black spruce has a structure peculiar to no other tree. The cones are aggregated at the very top of

the tree and occupy two to three feet. Below this clump, the trunk is clear for another two feet. While not all the individual trees have this form, a great many of the mature black spruce do exhibit this phenomenon. It has been attributed partially to squirrels; certainly squirrels do nip off many of the twigs during the late fall. The clear portion of the trunk acts as a barrier to the fire and in many cases the cones are scorched but not consumed (1, p. 54).

LeBarron (2) observed the peculiar crown form of black spruce in Minnesota and wrote as follows:

> When squirrels gather black spruce cones, they clip off entire twigs with the cones attached. Sometimes this results in a considerable amount of pruning near the tops of the trees where the cones are borne. Examinations of the upper portions of numerous trees have shown that the characteristic "bunchy" appearance of black spruce tops is caused by such pruning (2, p. 21).

Others have also observed the unusual crown form of black spruce. For example, Raup and Denny (3, p. 123) noted that ..."black spruce has a common habit of 'bunching out' at the very top"... and Stoeckeler (4) mentioned the ..."knob-like development on the crown tip"...

Observations of felled trees in Alaska show that the branchless stem segments in the upper part of black spruce crowns have resulted from pruning by red squirrels, Tamiasciurus hudsonicus. The branches are cut off close to the main stem and show tooth marks characteristic of red squirrel work. Collection of twigs bearing clusters of cones is certainly a more efficient way of harvesting than collecting the small cones individually. Red squirrels have also been observed cutting off cone-bearing branches and storing them in caches (fig. 2). The ground about the caches and feeding stations is commonly littered with the small branches or twigs. Extensive pruning of black spruce seems to indicate the coincidence of heavy seed crops and high red squirrel populations.

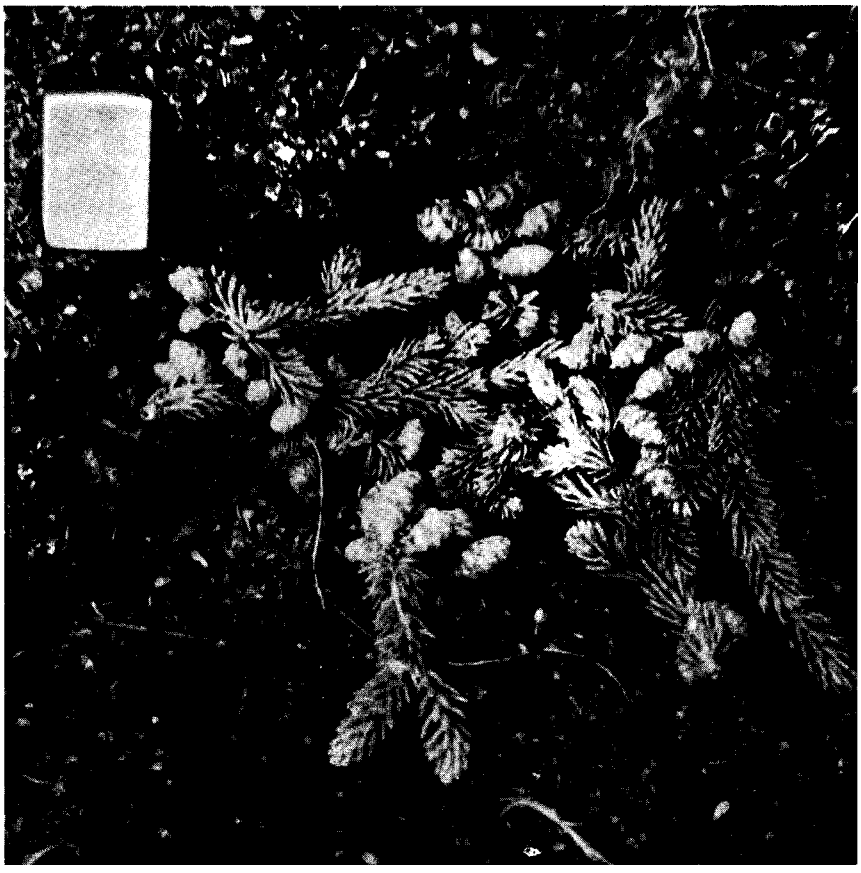

Figure 2.--Black spruce twigs with attached cones that have been pruned by red squirrels. Cached in a hole in a large pile of old cone scales at a feeding station. Dennison Fork of the Fortymile River, August 1, 1957. One-third natural size.

The observation, first reported by Millar (1), that the bare stem segments or gaps in the crown below the tuft of cone-bearing branches at the top affords these cones and their contained seeds a measure of protection from damage by fire is confirmed by the experience of the writer. It would seem that this is a situation in which a biotic effect, the direct results of which may be regarded as harmful, actually has an indirect result that is favorable. The reproduction that follows forest fires in mature stands of black spruce must come, in part at least, from seeds in the cones at the top that have been afforded a measure of protection by the "fire gaps" produced in the crown by red squirrels.

Literature Cited

(1) Millar, J. B.
1936. The silvicultural characteristics of black spruce in the clay belt of northern Ontario. A thesis submitted in partial fulfillment of the requirements for the degree of Master of the Science of Forestry. Univ. of Toronto, typewritten, 81 pp.

(2) LeBarron, Russell K.
1948. Silvicultural management of black spruce in Minnesota. U. S. Dept. Agr. Cir. 791, 60 pp.

(3) Raup, Hugh M., and Charles S. Denny
1950. Photo interpretation of the terrain along the southern part of the Alaska Highway. U. S. Geol. Survey Bul. 963-D. iv + 95-135 pp.

(4) Stoeckeler, E. G.
1952. Trees of interior Alaska, their significance as soil and permafrost indicators. Corps of Engineers, U. S. Army. Investigation of military construction in arctic and subarctic regions. Prepared by St. Paul District Corps of Engineers for Office of the Chief of Engineers, Airfields Branch, Engineering Division Military Construction. 25 pp.

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